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COMPLEXITY ☯ SIMPLICITY ☯ SIMPLEXITY[1]

MIGUEL PINA E CUNHA
Faculdade de Economia
Universidade Nova de Lisboa
Rua Marquês de Fronteira, 20
1099-038 Lisboa, Portugal
E-mail: mpc@fe.unl.pt
Tel: 351-212 822 725
Fax: 351-213 873 973

ARMÉNIO REGO
Universidade de Aveiro
Departamento de Economia, Gestão e Engenharia Industrial
Campus de Santiago
3810-193 Aveiro, Portugal
armenio.rego@ua.pt

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ABSTRACT

"In the midst of order, there is chaos; but in the midst of chaos, there is order", John Gribbin wrote in his book *Deep Simplicity* (p.76). In this dialectical spirit, we discuss the generative tension between complexity and simplicity in the theory and practice of management and organization. Complexity theory suggests that the relationship between complex environments and complex organizations advanced by the well-known Ashby's law, may be reconsidered: only simple organization provides enough space for individual agency to match environmental turbulence in the form of complex organizational responses. We suggest that complex organizing may be paradoxically facilitated by a simple infrastructure, and that the theory of organizations may be viewed as resulting from the interplay between simplicity and complexity.

Keywords: organization, simplicity, complexity, simplexity.

"Simplicity is not, well, that simple"

(Bonabeau, 2007: 68)

Complexity is a concept with an historical presence in the theory of organizations, or to be more precise, in the theory of complex organizations. Complexity is sometimes taken as a necessary condition for proper organizational functioning: only complex organizations can tackle complex problems. Managers have been urged to complicate themselves as well as their organizations: informed by Ashby's law of requisite variety (Ashby, 1956), they were told that only complexity could cope with complexity.

To make things more difficult, managers have also been advised to get rid of complexity: "The toughest job for top management may be keeping a business as simple as possible. Time and again, organizations get in their own way by inserting complexity in areas that don't need it", a team of BCG consultants wrote (Keverian, Taneja and Victor, 2005: 2). Complexity leads to labyrinthic designs, more or less immune to managerial change efforts. The best example of the complex and rigid organization is perhaps the Kafkaesque bureaucracy, almost impermeable to change attempts from above. Complexity may also breed difficulties of sensemaking and is reported to be at the root of disasters in such systems as banks, aircraft, power plants and space shuttles.

We suggest that it is not possible to understand organizational complexity without considering the role of simplicity. As noted by complexity theorists, "complexity arises from simplicity" (Gribbin 2004: 97). The dialectical view introduced by complexity theory resonates with ancient topics on the paradoxical nature of reality, which was discussed centuries ago by Greek and Chinese philosophers. For example, the Taoist method of knowing is now famous, with the visual representation of the tension between the forces of the Yin and Yang being iconic. According to this approach, paradoxical tension means harmony, whereas imbalance equals dysfunction. We

approach “complexity” as the result of a generative tension between what appears as complex, and the simplicity from where it emerges, explore the several meanings of the term “complexity” in the organizational literature, and propose that the common acceptance that organizations are complex should not lead researchers to overlook the role of simplicity in the creation of this visible complexity.

We have organized the paper as follows. First, we discuss the notions of complexity and simplicity in management, stressing their multiple meanings and their positive and negative implications. Then, we suggest that the evolution of organizational thinking can be portrayed according to the paradoxical combination of simplicity and complexity. The notion of simplexity illustrates the point. Finally, we focus on how simple designs may facilitate the emergence of complex and adaptive collective behavior. This last possibility has been exposed by complexity theorists in several domains but remains at the periphery of interest of management scholars and practitioners. We contribute to the management literature by suggesting that fresh theoretical insights may result from the analysis of how complexity and simplicity coexist and co-evolve.

COMPLEXITY AND SIMPLICITY IN MANAGEMENT

One of the most important features of formal organizations since the 19th century has been growth. The growth of firm size can be viewed as one of the major social transformations of our time. Perrow (2002: 1) observed that “the most important feature of our social landscape is the large organization”. Growing size and functional specialization correlate with higher organizational complexity, i.e. more subparts require more articulation. The coming of the large organization brought enormous managerial challenges, namely due to the fact that with size and the interconnection between the “specialized” components of the system, complexity grew significantly.

With the advent of the new post-Newtonian sciences, the idea of complexity, however, gained a new meaning. Due to work on the new science of chaos, complexity started to be viewed as a property of systems rather than as a more or less stable structural dimension. Next, we try to capture some of the organizational implications of complexity and simplicity, in both the Newtonian and post-Newtonian perspectives.

Organizational complexity

The complexity of organizations has been defined in a number of ways, from the number of hierarchical levels, the number of departments or human headcount to the systemic consequences arising from given structural properties. In other words, complexity shows systemic attributes (i.e., it is related to other properties), and as such it may be crucial for understanding the organization as a whole, each part of the organization being interconnected with the other parts. Growing size and complexity implied the need for more coordination. Growing complexity co-evolved with increasingly sophisticated administrative/formal systems aiming at uncertainty reduction. Complexity has then been viewed historically as associated with progress: growing complexity meant increasing specialization. In this perspective, complexity existed by design. Latter theories of organization accommodated the notion of complexity in more subtle ways. Karl Weick's work offers a good example. The process of organizing complexity is more complicated than that portrayed in structural-functional readings of the organization. It is recursive, ambiguous and situationally-embedded. Weick's thinking about complexity is neatly wrapped up in his famous quote: "complicate yourself" (Weick, 1979: 261).

But there is another form of complexity: unintentional complexity. Ashkenas (2007: 101 and 102, respectively) noted that "large organizations are by nature complex". And he provided an answer to the origin of such a complexity: "Complexity is the cumulative by-product of organizational changes, big and small, that over the years weave complications (often invisibly) into the way work

is done". It is this type of undesired complexity that creates organizational inefficiencies, lack of response capacity or organizational inertia, as well as a focus on the inner reality of the organization. To tackle these problems, organizations tend to take some steps toward simplicity.

Organizational simplicity

Undesired complexity is normally opposed with processes designed to increase simplicity. Simplification has been one of the core values of GE advocated by Jack Welch: "We found in the 1980s that becoming faster is tied to becoming simpler (...) If we're not simple we can't be fast .. and if we were not fast we can't win" (in Elderkin and Bartlett, 1993: 12). Simplicity is still one of the tools of GE's "Productivity toolkit" under Jeffrey Immelt's leadership. The goal: to drive out "extraneous costs incurred by overcomplicated processes and proliferation of options in sourcing and other areas" (Stewart, 2006: 60).

There is also a form of unintentional simplicity, however, as reflected in Miller's definition: "Simplicity is an overwhelming preoccupation with a single goal, strategic activity, department, or world view – one that increasingly precludes consideration of any others" (1993: 117). Miller's thesis suggests that in the long run, success will lead to simplification, a process he labeled as the Icarus paradox (Miller, 1990). Simplicity may thus diminish the organization's peripheral vision and favor exploitation over exploration. Core competencies may turn into core rigidities when organizations enter a spiral to simplicity.

What is both suggestive and intriguing about the notions of simplicity and complexity is the very different uses of the terms, and their dialectical relationship. The multiplicity of meanings reflected in Table 1 and the paradoxical possibilities discussed above suggests that rather than being opposites or poles in a continuum, complexity and simplicity should be addressed in a non-dichotomous way, as parts of the deep and inner order of complex systems - forces that coexist and

imply each other (Gribbin, 2004). Taking them as opposites diminishes the crucial role of simplicity in the understanding of complexity, and vice-versa. We, in turn, argue that only a focus on simplicity will make it possible to grasp the meaning of organizational complexity.

Table 1 about here

We next describe three major archetypes, i.e. generic models, of organizational theorizing on the basis of the interplay between complexity and simplicity. Our reading of the evolution of organizations results from the analysis of the hardware and software dimensions as different combinations of simplicity/complexity. Organizational hardware is basically related to design issues, whereas the soft dimension refers to the human component. In the first archetype, people are taken as simple, either because they are idle (a common assumption, as explained by McGregor, 1960) or because they presumably do not understand what is the best for the organization. Managers may therefore increase the level of complexity as a way to compensate for worker simplicity, in a context of growing product and market complexity. The second archetype maintains organizational complexity but develops a more positive view of humans, as complex beings. In the third archetype, the representation of people as complex/competent/agentic beings, may decrease the need for organizational complexity, and instead require relatively simple designs. These have been variously described as post-bureaucratic (by the optimists) or as "lite" forms of bureaucracy (by those who have seen much, e.g., Hales, 2002). The dialectic between organizational complexity ☯ simplicity may thus assume the different shapes that are elaborated below.

COMPLEXITY ☯ SIMPLICITY ARCHETYPES

To understand the complexity/simplicity interplay in the practice of management, one needs to articulate the crucial role of change. In the earlier theories of organization, change was an extra-ordinary occurrence, a process that increases uncertainty and that should thus be addressed and controlled by the top. Organizations were designed for stability and predictability. Advances in complexity theory show that this traditional paradigm is untenable and inadequate in organizational contexts where rapid, intense and incessant change is norm rather than exception. The openness of organizations to change has been fundamentally reconsidered in recent theorizing due to these scientific discoveries, and there are clear practical implications. Two quotes illustrate this paradigmatic shift in the relationship between change and organization:

- "Change must not be thought of as a property of organization; rather organization must be understood as a property of change – the attempt to simplify and stabilize what would have been an irreducibly dynamic and irreducibly lived experience" (Tsoukas, 2005: 101), or
- "Change never starts because it never stops"/"change is never off" (Weick and Quinn, 1999: 381 and 382).

The understanding of organization as a property of change rather than the other way around, helps to explain the three archetypes with which we stabilize/organize the following discussion on the changing theory of complex organizations. In the first case, change is viewed as engineered at the top, as something that people with authority impose upon the organization. In the second archetype, as explained by the quality movement, change results from the articulation of top-down schemes with relevant contributions from the base. In the third archetype, change is perceived as a result of the interconnectedness of multiple micro-conversations. Before moving to the archetypes, there is one question that needs to be asked. Do we really need more organizational archetypes? Maybe we do not, but archetypes compress multiple features of organizations and the organizational world is apparently undergoing a period of change: "everywhere you turn, hierarchies are being challenged

from below or transforming themselves from top-down structures into more horizontal and collaborative ones" (Friedman, 2005: 45). We attempt to capture part of the movement that is apparently pushing some organizations into experimentation with a new understanding of the role of simplicity and complexity. What differentiates this discussion from previous approaches of the topic is the idea that, underlying each evolutionary period there is a distinctive combination of simplicity and complexity. We contribute to the theory of organizations by discussing how the simplicity/complexity duality helps to shed light on forms of management. We thus do not claim that organizations will stampede toward the emerging paradigms; rather we suggest that some organizations are experimenting with possibilities of structuring around simplicity, instead of assuming, as Mintzberg and McHugh (1985: 160) once wrote, that the machine bureaucracy *is* structure and not a structuring possibility. The archetypes to be discussed below are the coercive bureaucracy, the learning bureaucracy and the post-bureaucracy/bureaucracy-lite.

The coercive bureaucracy

(complex organizations, simple practitioners)

> "Under scientific management (...) it becomes the duty and also the pleasure of those who are engaged in the management not only to develop laws to replace rule of thumb, but also to teach impartially all the workmen who are under them the quickest ways of working." (Taylor, 1911: 104)

Modern organizations resulted from the convergence of several powerful social innovations including scientific management, the technologies of mass production, and bureaucracy. The result is the archetype known as coercive bureaucracy. In this archetype, due to sophisticated technologies of soft control, work was fragmented to a high degree of detail, and people were socialized as obedient employees. Managers of these people acted, according to critics, as "psycho-surgeons"

(Leavitt 2007: 255) of the blue-collar workers' brains and implementers of job fragmentation. As designs grew in complexity, people's roles became simpler.

Complex design. The increase in the size of business firms was accompanied by increasing levels of internal complexity, materialized in practices such as standardization, the stringent job descriptions, fragmented operations, technological determination of job execution and the definition of human requirements. Systematization replaced tradition. Systematization resulted in new levels of detail and rigor. The case of the Ford Motor Company illustrates the point (Aktouf, 1994: 33): 7,882 operations were necessary to build a Model T. Of these, 949 required strong men, 3,338 could be performed by ordinary people; most of the others by women or elderly children. Some special cases were also observed: 670 could be executed by legless men, 2,637 by one-legged men, 2 by armless men; 715 by one-armed men and 10 by blind men. These were the times of the machine civilization led by engineers, a hyper-mechanized society of monotonous jobs, alienated workers and mounting dehumanization. A legacy of this era was the organization of detail. Organizations were imagined as machines, with "parts" being standardized, in the name of efficiency and progress. Management innovations such as detailed job contents, the study of time and motion and the creation of new organizational designs, such as the M form, resulted from the need to manage organizations whose level of complexity required a corresponding body of administrative staff.

Simple practitioners. Concurrently with growing structural complexity, people were socialized as obedient employees. As designs become increasingly tighter, people's roles became simpler. Schmidt, the famous character in Taylor's book (Taylor, 1911: 44-45), is a perhaps extreme illustration of the role of people in the coercive bureaucracy. Schmidt is the ultimate evidence of the superiority of the system: it is the system's excellence that made scientific management irresistible, not the superiority of people. In fact, the system assumed the limitations of employees and turned them into opportunities. Schmidt, "a man of the mentally sluggish type" (Taylor, 1911: 46),

indicates that the system is robust enough to counterbalance the more than obvious weaknesses of employees. There are multiple versions of managing people as simple beings. So called “McJobs” are so tightly scripted that in the end “the different people doing them all seem strangely the same” (Ten Bos and Rhodes 2003: 412).

Fast forward, from Taylor to the present: Shari Ballard, executive vice-president at Best Buy, discussed the risks of the complex organization/simple people combination: “Look at why big companies die. They implode on themselves. They create all these systems and processes – and then end up with a very small percentage of people who are supposed to solve complex problems, while the other 98% of people just execute” (Anders, 2007: 27). Workers were reduced to the level of instruments/machines.

The representation of employees as simple was, however, perceived in some companies as a source of inefficiency. Some organizations therefore experimented with a new form of organization that accommodated the representation of people as complex: the learning bureaucracy, a form so rare and delicate that some may qualify it as an oxymoron.

The learning bureaucracy

(complex organizations, complex practitioners)

> “Standardized work is a concept that is often misused in the context of the lean journey. Many times we have heard the comment that standardized work is going to make a bunch of robots out of us, and take away our ability to think. Our response is, on the contrary, standardized work in the Toyota culture does just the opposite. It is the baseline for improvement.” (Liker and Hoseus, 2008: 163)

By the mid 20th century, a new archetype was being moulded in some organizations. They were still very complex, but took their employees as complex people – in the sense that they were considered as differentiated individuals with unique skills. The revolutionary discovery of Toyota was the acceptance that complex organizations may work better and be more competitive with complex and empowered people. Studies of the Toyota production system, and namely the iconic NUMMI factory, illustrate the strengths of the enabling bureaucracy (Adler, 1993). Here, people are not supposed to simply obey, but to facilitate learning and generate discoveries that may improve the system as a whole, incrementally. The kaizen philosophy provides the practical illustration that complex organizations are not incompatible with complex people – quite the opposite. In the learning bureaucracy, complex organizational designs coexist with a complex view of people.

Complex design. The design of Toyota's automobile plants is certainly no less complex than that of its historical American rivals. Jeffrey Liker's multi-volume study of the case of the Japanese auto- maker, shows how complex the operation is (e.g. Liker & Hoseus, 2008). It also indicates that the now famous "Toyota way" is not loose in controls and standardization when compared with other companies in its sector. According to Takeuchi, Osono and Shimizi (2008: 97), "no company practices Taylorism better than Toyota does". Standardization, in fact, apparently is everywhere and is a central dimension of the quality management culture: no standards, no problems. In a sense, Liker's *oeuvre* suggests that the Toyota way is about the standardization of everything and that the organization's design is still highly centralized, detailed and top-down. These characteristics, however, are seemingly complemented with an unusual capacity to mobilize worker participation and involvement. In other words, people were treated as complex beings whose collaboration is necessary to efficiently operate such a complex organizational system geared to change.

Complex practitioners. The dedicated Honda employee described by Peters and Waterman (1982: 37) as someone that "just can't stand to see a flaw in a Honda!" may represent the ideal of the

person in this archetype. As described by Hamel (in Barsh, 2007: 30), when one looks at companies close to this archetype, one sees "the ability to mobilize the intelligence of so-called ordinary workers. Going forward, no company will be able to afford to waste a single iota of human imagination and intellectual power." Hence, the "secret" behind "Toyota talent" and its equivalents, may be the belief in the possibility of building extraordinary organizations with ordinary individuals. This view is complemented by that offered by Kellerman on her work on followership (Kellerman, 2008): the fate of big organizations depends on how well they understand and respond to their low-ranking employees, namely how they stimulate their psychological energy and willingness to contribute.

The transition from bureaucracies to bureaucracy-lite or post-bureaucracies as they sometimes are called, occurred when the costs of organizational complexity became too high. As noted by Barsh (2008: 25), "the 20th century model of designing and managing companies, which emphasized hierarchy and the importance of labor and capital inputs, not only lags behind the need for companies today to emphasize collaboration and wealth creation by talented employees but also actually generates unnecessary complexity that works at cross-purposes to those critical goals." Hence the emergence of the lite-bureaucracy, simple organization with complex practitioners.

Post-bureaucracy/Bureaucracy-lite

(simple organizations, complex practitioners)

> "Highly talented people don't need, and are unlikely to put up with, an overtly hierarchical management model" (Gary Hamel, in Marsch, 2008: 30).

A new approach to strategy and design is being explored in some organizations, especially those competing in fast-changing markets. Possible examples of these forms, post-bureaucratic or lite-bureaucratic as Hales (2002) called them, are the companies considered by Hamel (2007) as

representatives of the “future of management”. Organizations competing on the basis of simple designs accept that they may cope with external turbulence with flexible networks of highly autonomous individuals and teams, and by stimulating intrapreneurship. Rules and hierarchies may still be there but in attenuated form. As a result, the simplicity of design is not an obstacle to complex organizational responses. On the contrary, it is design simplicity that makes flexibility and adaptiveness possible.

The notions of semi-structuring or minimal-structuring represent a way of expressing what simple organizational designs may look like, giving people space to inform the strategy. The traditional, centralized and bureaucratic modes of operation clash with the need for speed and decisiveness that can only come from agentic people, commited to an engaging but open-ended shared purpose. In these organizations, people “don’t have to ask permission” to improve the organization, as noted by a Google employee (Iyer and Davenport, 2008: 65). Simple designs are sufficient to produce complex collective behavior (complex designs inhibiting them), in such a way that the capacity for re-creation and transformation of the organization are integral attributes of the system.

Simple design. The simplicity of design is not an obstacle to the complexity of action. Simple rules may facilitate the emergence of highly complex systems united more by a logic of attraction (Weick and Quinn, 1999) than by authority cascading from a hierarchy. Due to the relative autonomy of their agents and the loose coupling of their parts, these complex systems may be better equipped to deal with surprise and happenstance than hierarchical, centrally-controlled systems. Organizing, in this case, may be influenced by leaders but should be viewed, above all, as a bottom-up dynamic (Marion and Uhl-Bien, 2003: 56). This change in perspective is a radical break with the past, especially if one considers the fact that a major goal of early-modern theories of organization was the removal of uncertainty and surprise. Complexity-based approaches, on the contrary, explicitly aim to accommodate surprise and unexpectedeness through interaction and iteration. This capacity

results, to a great extent, from the agency of organizational members. General Electric's plant in Durham, North Carolina (http://www.fastcompany.com/magazine/28/ge.html) provides a good illustration of the nature of simple designs.

Complex practitioners. Changes in work and technology led to a reconsideration of the role of people. The former "employees" are now described by Hamel (2007: 208) as "vassals and conscripts". This author offered, in turn, an alternative exemplar of the role of people: Dave Myers, the intrapreneur that started the guitar-string business at W.L. Gore (Hamel, 2007: 90). Myers, an engineer who worked on cardiac implants, decided to use his dabble time pursuing a guitar-string project using a polymer that W.L. Gore developed for the medical industry. As a result, the firm entered the music business with impressive results.

In the same vein, some executives are now empowering grassroots initiatives from employees and supporting their roles as change agents from the bottom-up. The justification for the power of the combination of simple organizational design/complex people lies in the fact that it creates ample space for participation. In other words, participation is not offered as a way of stimulating people's adherence to the organization's goals (as, for example, in goal setting), but it is the essence of this form of organization and the best way to put human potential at the service of organizational renewal. The role of participation as a simple rule that enhances organizational connectivity has been explored by Ashmos et al. (2002) and can be illustrated with the case of AES, a firm in the electricity business. In this company, independence is prized, and a bad hire is described as "someone who needs specific direction" (Pfeffer, 1997: 8). Strategizing may be viewed as dialogue, with people contributing to strategy by interacting, talking, and making sense. Strategy is the result of polyphony rather than a plan crossing the organization, top to bottom, in search of implementation.

Table 2 synthesizes the major traits of each archetype, with the previous discussion indicating that the fit between complex environments/complex organizations may be reconsidered: only simple designs are open enough to allow the emergence of the collective complexity needed to cope with environmental change. We explore some of the implications of this hypothesis in the following section.

Table 2 about here

WHAT IF ONLY SIMPLICITY COULD COPE WITH COMPLEXITY?

Complexity theory is uncovering the deep simplicity from which complexity arises: simple laws, non-linearity, and sensitivity to initial conditions (Gribbin, 2004: 59). The "world of chaos" based on the generative relation between simplicity and emergence is very different from the mechanical clocks imagined by early organization and management scholars. Among the implications of this new logic is the awareness that the traditional notion of strategy as a top job should be complemented with the practice of strategy as a collective endeavor facilitated at the top. According to Roberts and Eisenhardt (2003), in turbulent settings the organization itself may be the strategy, i.e. strategic movements are no longer initiated solely at the top, but result from agentic choices made at every organizational level, which means that organizations need to create designs that favor alertness and capacity of response: strategic moves should be triggered wherever the information is.

Recent evidence on swarm organizing are clear in this respect: traditional descriptions no longer capture the organizing processes taking place in companies where the principles of complexity theory are taken seriously as a basis for design. It was the power of swarm intelligence, for example, that led to the creation of the World Wide Web: groups of people swarming together with a common purpose. A meaningful purpose may unleash tremendous amounts of psychological

energy and be much more gratifying for talented people than standard management goals. In fact, members of a swarm "typically reject the traditional business notion of building shareholder value as the basis for their decisions and actions" (Gloor and Cooper, 2007: 81). Strategizing "at the edge of chaos, where complexity lives" (Gribbin, 2004, p.103) represents a major challenge for both scholars and practitioners. Developing strategies at the edge of chaos may be sustained with a simple infrastructure, designed to facilitate emergence and self-organization.

The simple infrastructure

Recent work shows that simple infrastructures may facilitate the emergence of complex collective behaviors, with levels of flexibility and adaptability that are less likely to be found in traditional, hierarchical and centralized forms. We consider three possible elements of such a simple infrastructure: simple rules, adaptive leadership and empowerment. Certainly others may exist, but these cover three pivotal areas of organization: design, leadership and followership.

Simple rules. The traditional definition of complexity in organization theory was associated with the profusion of hierarchical levels, job descriptions, and rules. "Complexity" in the interpretation informed by complexity theory, refers to the enhancement of connections between individuals (Ashmos et al., 2002: 194). This form of complexity results from what scholars describe as simple rules, i.e. "a few straightforward, hard-and fast rules that define direction without confining it" (Eisenhardt and Sull, 2001: 107). As Brown and Eisenhardt (1998: 18) have put it, "Although the behavior that emerges is complex, the rules that guide it are necessarily simple. In fact, it is their simplicity that creates the freedom to behave in complicated adaptive, and surprising ways." Simple rules facilitate the creation of fluidity. Simple rules may be an adequate form of organizing because they facilitate adjustment to turbulence and environmental change.

Adaptive leadership. In a paper on the role of leadership of organizations as complex adaptive

systems, three types of leadership were contrasted: administrative, enabling and adaptive (see Uhl-Bien et al., 2007 and Table 2). Adaptive leadership is the style that best fits the architecture of simplicity that facilitates emergent self-organization. Administrative leadership corresponds to the bureaucratic type: leaders control the execution of orders and the good functioning of the hierarchy. In our formulation, enabling leaders operate in the complex organization/complex people combination. They facilitate the continuous improvement of the system as designed at the top. Adaptive leadership facilitates change from the bottom-up. Adaptive leaders support "correlation" (Plowman et al., 2007: 345) and the emergence of spontaneous novelty from within the system. They do so by disrupting existing patterns, encouraging innovation, and acting as facilitators of sensemaking. These are roles very distant from the ones typically attributed to leaders in established leadership theories.

Empowerment. The management of people is also accommodating to the new logic of complexity: "vassals and conscripts" are being replaced by citizens and enthusiasts. This is done, among other ways, via the replacement of formal surveillance by soft forms of power, namely control through premises and empowerment (Marion and Uhl-Bien, 2001). Detailed job descriptions and high levels of formalization lose their importance and are replaced by involvement-oriented mission statements, open-ended job descriptions, architectural spaces that facilitate interaction, and a new, adaptive, style of leadership: leaders are viewed as facilitators rather than controllers of organizational members with broader job descriptions: "personnel whose jobs are not fully specified have the slack needed to exploit opportunities" (Marion 1999: 86).

These changes are consistent with the discoveries of complexity theory that indicate that complex networks result from bottom-up interaction, facilitated by leaders acting as catalysts. As Marion and Uhl-Bien (2001: 405) have noted, "leaders of complex organizations drop seeds of emergence". The implementation of this type of practice at AES has been described as resulting in extreme

delegation, a practice that builds upon a specific understanding of the relationship between people and organizations: “AES’s philosophy is to treat everyone as responsible accountable adults, not as children whom have to be constantly supervised and instructed.” (Malone, 2004: 48). This is also consistent with Casti’s (1994) observation that complex systems exhibit a diffusion of authority whereas in simple systems power is generally concentrated in a few decision makers. In this sense, complex organizations may be viewed as simpler than the ones described here as “simple designs”, an observation that, again, is in tune with Casti (1994): complexity does not depend only on the object itself, but also on the language used to describe the object.

Complex behavior

Simple infrastructures may result in complex behaviors because they support and facilitate a number of processes that encourage rich and mindful interactions. The “nervous system” of the processes of organizing in bureaucracy-lite shifts from managerial fiat to the interactions that permeate the organization and increase the willingness and capacity of the system to adapt by using two of the central processes of complex adaptive systems: emergence and self-organization. Distributed intelligence prevails, rather than strict managerial intelligence (Marion and Uhl-Bien, 2003). In managerial terms, this may result from three processes previously identified in the literature: heed (Weick and Roberts, 1993), swarm intelligence (Gloor and Cooper, 2007) and improvisation (Crossan and Hurst, 2006).

Heed. One of the potential results of deliberately organizing around simplicity is the creation of a developed collective mind, or what Weick and Roberts (1993) describes as heedful interrelating. The concept refers to a developed attentiveness and caring about the actions of the other organizational members, in such a way that individual know-how is made subservient to group processes. Contribution and subservience to the group depend on the existence of a common

representation of both the purpose and the interrelatedness of action. This is more difficult when hierarchy and its influence prevail.

Empirical evidence presented by Bijlsma-Frankema, de Jong and Van de Bunt (2008) showed that the quality of interrelating, resulting from a combination of trust and monitoring, influences team performance. Teams perform better when order and control come from the inside and when heed is present, rather than when close supervision contribute to heedless interactions – as in the extreme case of groupthink, in which cohesive groups do not possess a developed group mind: their system of interrelation and cognition is rather thoughtless and careless.

Swarm intelligence. Interest in the notion of swarm behavior resulted from the observation of the sophisticated forms of organizing of social insects such as ants and bees, whose interactions express a high degree of collective intelligence (Gloor, 2006). This collective intelligence results from networks of interactions and can be described as "the emergent collective intelligence of groups of simple agents" (Bonabeau, Dorigo and Theraulaz, 1999). The swarm intelligence approach emphasizes distributedness, direct and indirect interactions among relatively simple individuals, flexibility, and robustness. It is the distributed intelligence of the whole that develops these qualities rather than the competence of a few members at the center of the network. This is in sharp contrast with dominant views of the organization where intelligence is taken as concentrated at the top.

Improvisation. The central role of planning as a mechanism of anticipation and prediction is giving way to the recognition of its strong emergent component. Hence, organizations need to find a new combination of planning/anticipation and reaction. Minimal structuring, as discussed above, may accommodate these contradictory needs: it provides focus and coordination, but simultaneously opens free space for improvisation to occur. Improvisation is the conception of action as it unfolds, by organizational members, drawing on available material, cognitive, affective and social resources.

It synthesizes planning and execution, combining practices that were often viewed as incompatible: "sense and respond, launch and learn, try and trash" (Kanter, 2002: 81). Improvisation facilitates renewal through emergence, by allowing action without establishing where it will lead. Improvisation stimulates complex behavior because it departs from the model of the obedient executant and stimulates distributed intelligence in action.

FINAL COMMENT

> "After all, when compared to large companies, the most adaptable things on the planet are either *under*-managed or, *Mon Dieu*, *un*-managed" (Hamel, 2007: 180)

As Simon (1962) noted, how complex or simple a structure is critically depends upon the way in which it is described by the observer. Under the traditional Newtonian paradigm of abstract formalism and decontextualized organization, there were reasons for defending the increase of complexity from the top: sophisticated hierarchies (complex systems composed of subsystems that have their own subsystem, and so forth; Simon, 1962) were necessary for the creation of sophisticated products. Only complexity, managers were told, could cope with complexity.

Complexity theory underwent a shift of the Kuhnian type, and showed that there is a profound and generative tension between the simple and the complex. In this sense, only simplicity can cope with complexity. We thus have transferred to the organization studies the fundamental question of "how complexity arises from simplicity" (Gribbin, 2004: 97).

We offered a different view of the relationship between complexity and simplicity in organizing. These were not considered as opposites or poles in a continuum, but rather as deep forces in tension. The potential of this tension should not be discarded, given that the theory of organization, as we know it, is showing signs of inability to deal with many contemporary challenges, as society

moves to a creativity economy. As Florida pointed out (2002: 22), “the biggest issue at stake in this emerging age is the ongoing tension between creativity and organization”.

In our exploration of the interplay between complexity and simplicity, we discussed how simplicity may lead to complexity and how complexity may turn into simplicity. Complex systems grow from “deep simplicity”, but complicated systems may become too simple, as discussed by Miller: “A rich and complex organization becomes excessively simple – it turns into a monolithic, narrowly focused version of its former self, converting a formula for success into a path toward failure.” (Miller, 1993: 116).

Several implications result from the dialectics of complexity/simplicity, four of which are explored here. First, there is an inseparable relationship between simplicity and complexity. The notions of simplicity and complexity are more challenging than usually considered, and they exist as parts of a paradoxical process, in tandem, not as more or less static structural variables. The need to develop a fine-grained view of the relationship should thus be considered. For example, some research suggests that different “doses” of simplicity may be adequate in different phases of an organization’s life cycle: simple decision-making processes may be positive for young organizations competing in homogeneous business environments, but negative for mature organizations inhabiting heterogeneous business landscapes.

Second, the complexity perspective stimulates management scholars to search for new principles of organizing around deep simplicity, which may imply a revision of some received management wisdom. Managers of modern organizations have been exhorted for decades to focus and concentrate. Some of them discovered that the need to focus may actually increase the dangers associated with lack of peripheral vision. This problem may be aggravated with the increasingly salient role of the Internet as a platform for organization. As observed by Hamel (2007: 252), “the

web is all periphery and no center". The idea of a society organized around the periphery (rather than the center, such as the organization) is an intriguing possibility, a glimpse of a post-organizational society, a world of intelligence dispersed throughout self-reconfiguring networks where the two less common "ways of doing things" (heterarchy and responsible autonomy, see Fairtlough, 2005) will possibly gain importance. In such a world, managers may be asked to act more as cross-enterprise facilitators of self-organizing, rather than the 20th century-like unit managers (Crossan and Olivera, 2006).

Third, long-lasting binary oppositions (organic vs. mechanistic types), may not be tenable. Mechanistic elements may actually coexist with organic ones. Order and chaos, planning and emergence, structure and freedom, all these "attractors" suggest that traditional oppositions may be inadequate for understanding systems that deviate from traditional Newtonian clockworks and that are pervaded by paradoxical requirements. The role of paradox, contradiction and surprise, should be considered and appreciated rather than discounted or understood as deviation or anomaly.

Fourth, it is recommendable to think beyond complexity and simplicity in separation. If there is a tension between simplicity and complexity, one should, for example, think about the implications of complicating parts of the system while simplifying others. The structural complexity of large organizations is accompanied by the simplification of the role and contribution of many of its members. The large organization is complex when viewed in a macro-structural perspective, but can be simple when perceived from the perspective of the worker who performs endless repetitions of the same operations. A fractal-type view of the organization may highlight cross-level articulation between simplicity and complexity.

We suggested that organization and management scholars tend to appreciate more the value of complexity rather than that of simplicity, despite the arguments for simplicity present in notions as

old as William of Ockam's (1288-1347) "Occam's razor". Researchers may therefore wish to explore the promising avenues that the simplicity/complexity interplay suggest, namely the observation that "the way to make complex structures out of simple rules, we know, is repetition." (Gribbin, 2004: 99). Repetition is often viewed as the hallmark of the old-fashioned Taylorist organization. However, repetition has a fundamental role in the evolution of complex systems from simple rules. This is because the exercise of repetition involves both deviation-reduction and deviation-amplification elements. Repetition may thus be taken as an inherently adaptive process. As employees enact local improvisation to implement repetitive procedures and achieve formal goals, they contribute to the sedimentation of unprescribed practices into an emergent and adaptive strategy. In this sense, mindful repetition as presented by complexity theory may represent the mirror image of mindless repetition in scientific management, a possibility that shows that even the most simple management concepts may still be too complex and surprising.

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Table 1

How the literature views organizational simplicity and complexity

Complexity	
Complexity by design	**Unintentional complexity**
Defined: "Refers to the number of subparts within the organization. A complex organization has many parts that have to be interrelated and coordinated, while a simple organization may have only a few separate parts" (Daft and Steers, 1986: 219).	Defined: "the cumulative by-product of organizational changes, big and small, that over the years weave complications (often invisibly) into the way work is done." (Ashkenas, 2007)
Implications: "Complexity takes the form of hierarchy" and "hierarchic systems will evolve far more quickly than nonhierarchic systems of comparable size" (Simon: 1962/2003: 16)	Implications: "Complex, interconnected systems generate many, sometimes unexpected or counterintuitive vulnerabilities" (Bonabeau, 2007: 64)
Simplicity	
Simplicity by design	**Unintentional simplicity**
Defined: "Simplicity, to an engineer, means clean, functional winning designs, no bells or whistles. In marketing it might manifest itself as clear, unencumbered proposals. For manufacturing people it would produce a logical process that makes sense to every individual on the line. And on an individual, interpersonal level, it would take the form of plain-speaking, directness, honesty" (Jack Welch, in Elderkin and Bartlett, 1993: 12)	Defined: "Simplicity is an overwhelming preoccupation with a single goal, strategic activity, department, or world view – one that increasingly precludes consideration of any others." (Miller, 1993: 117)
Implications: "when the business landscape was simple, companies could afford to have complex strategies. But now, that business is so complex, they need to simplify" (Eisenhardt and Sull, 2001: 107)	Implications: "As simplicity increases in a company, secondary issues are forgotten, and the parties responsible for them lose influence. The organization becomes more monolithic" (Miller, 1993: 117); "Simplicity is dangerous because it can blind managers" (Miller, 1993: 130)

Table 2

The evolving role of complexity in organization studies

Archetype and moment	**Dialectic**	**Design**	**Leaders and the led**	**Exemplars**
1. Early 20th century: Coercive bureaucracy	Complexity by design; top- down dynamic Keywords: efficiency; scale; control	Complex, leader-centric organizations Types: functional, M-form	Simple people Obedience Administrative leadership Type: Taylor's (1911) Schmidt	Ford Motor Co. State bureaucracies
2. Mid-20th century: learning bureaucracy	Managed complexity; top- down and bottom-up dynamic Keywords: total quality management; kaizen; six sigma	Complex organizations Types: functional, M-form	Complex people Diligence Enabling leadership Type: Honda's dedicated employee in Peters and Waterman (1982)	Toyota Southwest Airlines
3. Early 21st century: bureaucracy-lite	Emergent complexity; bottom-up dynamic Keywords: relentless innovation; adaptability; nonconformity	Simple, member-centric organizations Types: adhocracies, heterarchies, networks	Complex people Innovation Adaptive leadership Type: W.L. Gore's Dave Myers, the intrapreneur in Hamel (2007)	W.L. Gore GE Durham Google AES